BTS Statement

Pulmonary rehabilitation

British Thoracic Society Standards of Care Subcommittee on Pulmonary Rehabilitation

Scope, introduction and background

The aim of pulmonary rehabilitation is to reduce disability and handicap in people with lung disease and to improve their quality of life while diminishing the health care burden. The fundamental principles of rehabilitation (box 1) are widely accepted and practised unquestioningly in other medical disciplines, yet a recent survey has shown that provision of pulmonary rehabilitation services in the UK for one of the most common causes of disability is very poor.[1] In other countries, particularly North America, pulmonary rehabilitation has always had a more prominent role in the care of patients with chronic lung disease.[2 3] The historical reasons for the poor showing in the UK are complex, but may include medical indifference to non-pharmacological management, lack of scientific evidence, poor funding, and ineffective consumer demand. Clinical guidelines also appear to be lagging behind the strength of evidence in respect of rehabilitation.[4]

Opinions, however, are now beginning to change as the benefits are becoming clear to both clinicians and their patients. The scientific evidence is also beginning to grow as investigative tools appropriate to respiratory medicine and compatible with the original World Health Organisation outcomes of impairment, disability, and handicap have been developed.[5] There is now strong scientific evidence to recommend the application of pulmonary rehabilitation programmes that comprise physical training, education, dietetics, occupational therapy, psychology, and social support. The benefits include improvements in exercise performance, health status, dyspnoea, and reduction in usage of health services. Other potential advantages are suspected but, as yet, unproven.

Summaries of the scientific evidence and recommendations for practice have recently been published by the American Thoracic Society and in the ACCP/AACVPR evidence-based guidelines.[2 6] This document from the British Thoracic Society is therefore not intended to become another new set of guidelines but, instead, will develop these existing publications and introduce more recent evidence. The purpose is to summarise the available evidence for both the process and benefits of pulmonary rehabilitation to convince providers, commissioners, and consumers of health care to introduce a worthwhile service. It should be of value to clinicians wishing to set up or develop a service, to public health physicians who wish to evaluate the evidence, and to patient groups who want to campaign for improved local services. The document has been developed by a subcommittee of the Standards of Care Committee of the British Thoracic Society (BTS). Membership of the subcommittee included physicians with and without a declared interest in pulmonary rehabilitation, a physiotherapist, an exercise scientist, and clinical psychologists.

New references are cited where assertions are not supported in the existing statements and guidelines. These new references from January 1999 to February 2001 were obtained by an electronic literature search of Medline using the key words "pulmonary rehabilitation", "COPD", and "exercise and training". A total of 50 additional original papers published in peer review journals were identified. Practical recommendations for the process and management of pulmonary rehabilitation are given in the text and tables. The strength of evidence was agreed by consensus and is described according to the accepted convention (table 1).[7] The document was reviewed by the Standards of Care Committee, and a draft copy was also made available for comment for a limited period to members of the BTS on the official website.

- The goals of rehabilitation are to reduce the symptoms, disability, and handicap and to improve functional independence in people with lung disease
- It is assumed that optimum medical management has been achieved or continues alongside the rehabilitation process
- The rehabilitation process incorporates a programme of physical training, disease education, nutritional, psychological, social, and behavioural intervention
- Rehabilitation is provided by a multiprofessional team with involvement of the patients' family and attention to individual needs
- The outcome of rehabilitation for individuals and programmes should be continually observed with the appropriate measures of impairment, disability, and handicap.

Box 1 General principles of rehabilitation.

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Table 1 Levels of evidence and grading of recommendations[7]

Level	*Type of evidence*
Ia	Meta-analysis of randomised controlled trials
Ib	At least one randomised controlled trial
IIa	At least one well designed controlled study without randomisation
IIb	At least one other type of well designed quasi-experimental study
III	From well designed non-experimental descriptive studies
IV	Expert committee reports of opinions and/or clinical experiences of respected authorities
Grade	*Type of evidence*
A (levels Ia,Ib)	Requires at least one randomised controlled trial
B (levels IIa, IIb, III)	Well conducted clinical studies but no randomised controlled trial
C (level IV)	Expert committee reports or opinion. Indicates absence of directly applicable studies of good quality

Size of the problem in the United Kingdom

The majority of people with chronic respiratory disability suffer from chronic obstructive pulmonary disease (COPD). Surveys of people with chronic lung disease by the British Lung Foundation suggest that 90% of chronic lung disease is due to chronic airflow obstruction.[8] There are approximately 600 000 people in the UK with COPD, most of whom present to their doctors with symptoms after the age of 40.[9] At the moment the prevalence rates are higher in men, but this is now beginning to equalise.[10] Prevalence also rises with age and is currently 5% in men aged 65–75, increasing to 10% in men over 75 years. Older patients are therefore likely to suffer multiple disability. Clear data are not available for prevalence according to severity, but surveys of individual general practices suggest that approximately one third of sufferers may have significant disability. Figures are stable overall in the UK, but the prevalence of COPD in developing countries is expected to rise steeply as tobacco consumption increases.[11]

Summary of key points

Selection

- Although most patients will have COPD, the benefits of rehabilitation may apply to all patients with dyspnoea from respiratory disease. **[B]**
- The introduction of rehabilitation becomes appropriate when patients become aware of their disability. Rehabilitation should be considered at all stages of disease progression when symptoms are present and not at a predetermined level of impairment. This would usually be MRC dyspnoea grade 3 or above. **[C]**
- There is currently no justification for selection on the basis of age, impairment, disability, or smoking status. Some patients with serious co-morbidity such as cardiac or locomotor disability may not benefit as much. **[B]**
- The only issues material to selection are poor motivation and the logistical factors of geography, transport, equipment usage, and the group composition. **[C]**

Setting

- Pulmonary rehabilitation is effective in all settings including hospital inpatient, hospital outpatient, the community, and the home. **[A]**
- Cost comparison suggests that hospital outpatient rehabilitation is currently the most efficient form of delivery. **[C]**

Programme content

- Outpatient programmes should contain a minimum of 6 weeks of physical exercise, disease education, psychological, and social intervention. **[B]**
- Physical aerobic training, particularly of the lower extremities (brisk walking or cycling), is mandatory. **[A]**
- Upper limb and strength building exercise can be included. **[B]**
- Exercise prescription should be precise and individually assessed. **[C]**
- Individual training intensity should be recorded and can be increased through the programme where tolerated. **[C]**
- Training intensity should usually be 60–70% of $\dot{V}O_2$peak (this can be derived from SWT performance). However, benefit can be obtained from lower intensity training where necessary, and increased benefits can be obtained from higher intensity training (85% $\dot{V}O_2$peak) when this can be achieved. **[C]**
- Training frequency should involve three sessions (20–30 minutes) per week of which at least two should be supervised. **[C]**
- Supplementary oxygen during training should be provided where clinically important desaturation is documented at the training workload. **[C]**
- Comprehensive disease education for patient and family is an important part of overall management that can be conducted within the rehabilitation programme. **[C]**
- Access to individual advice on physiotherapy, nutrition, occupational therapy, smoking cessation, end of life planning, and physical relationships is desirable. **[C]**

Process

- A nominated clinician with an interest in respiratory disease should be responsible for the programme. This clinician should normally be responsible for medical assessment prior to entry to the programme. **[C]**
- The programme should have a responsible officer appointed for the purpose. The coordinator may come from a profession allied to medicine or nursing. **[C]**
- Staffing ratios will vary according to the patient characteristics, but a staff/patient ratio of 1:8 would be reasonable for the supervision of exercise classes. **[C]**
- There should be multiprofessional involvement from local resources. **[C]**
- Policies should exist for the stages of rehabilitation which include referral, assessment, selection, rehabilitation, and outcome assessment. **[C]**
- Regular audit of the programme is desirable. **[C]**

Outcome measures

- These should be embedded in the programme as part of the process. **[C]**
- The outcome measures should reflect the goals of rehabilitation by examination of relevant impairment, disability, handicap, and domestic activity. **[C]**
- Outcome measures need only be simple but centres with expertise can use advanced technology. **[C]**

Target population and selection of patients: who benefits?

The medical management of patients entering rehabilitation needs to be optimal. Pulmonary rehabilitation may subsequently benefit all patients with lung disease whose lifestyle is being adversely affected by chronic breathlessness. The vast majority of these patients will have COPD. Patients with other chest conditions causing breathlessness, such as chronic asthma, bronchiectasis and pulmonary fibrosis, may also benefit. There is little specific published evidence for the effectiveness of rehabilitation in those without COPD. Where comparisons have been made, the results in non-COPD appear to be identical to the rest of the published literature. Obviously, if a programme has a specific non-COPD patient population, the details of the process may need to be modified to meet those needs. Patients with locomotor problems, significant cardiac disease, or cognitive impairment will be limited in their ability to exercise or comprehend. Patients with unstable angina or aortic valve disease may be unable to exercise safely. Some have suggested that it may be inappropriate to treat current smokers,[12] but there is no evidence to support their exclusion and they may obtain similar benefits to others if compliant. However, smoking cessation is obviously desirable.

Since the demand is likely to exceed resources, some selection may be necessary. No formal trials of selection criteria exist, although it is known that the benefits are independent of age or severity.[13] It is therefore likely that concordance with the programme will relate to motivation and access. Formal assessments of motivation have not been made, although informal assessment can be made by interview. Non-compliance relates to social isolation, lack of social support, and continued smoking.[14] The programmes can be made more accessible by the careful choice of location or the provision of transport.

The process of pulmonary rehabilitation

SITE AND PERSONNEL

The most recent definition of pulmonary rehabilitation is "a multidisciplinary programme of care for patients with chronic respiratory impairment that is individually tailored and designed to optimise physical and social performance and autonomy".[2] The location of the programme is less important than the content. Approximately one third of hospitals in the UK provide courses and the majority use hospital facilities.[1] In the UK we have some experience with outpatient programmes but only limited experience of providing inpatient, home, or community rehabilitation. However, recent papers describe home rehabilitation by specialists in the UK and elsewhere and exploration of the potential in primary care is beginning.[15–18]

The success of rehabilitation programmes is attributed to the multiprofessional team. This may involve dedicated sessions from personnel including the physician, physiotherapist, nurse, dietician, social worker, occupational therapist, pharmacist, lung function technician, and previous course graduates. All these personnel should be available in most hospitals. Psychologists and exercise scientists, while not always as accessible, may make a valuable contribution.

> Evidence exists that a multiprofessional individually tailored programme of rehabilitation including prescribed endurance exercise training should:
> - Improve functional exercise capacity **[Ia]**
> - Improve health status **[Ia]**
> - Reduce dyspnoea **[Ia]**
> - Have some health economic advantages **[Ib]**

Box 2 The benefits of pulmonary rehabilitation based on present evidence.

FORMAT, CONTENT AND BENEFITS

Trials of pulmonary rehabilitation have shown good results with various strategies. These include supervised outpatient attendance (1–5 sessions per week) and daily inpatient programmes. The consensus of the committee was that at least three exercise sessions per week are necessary for sustained improvement, two of which should be supervised. There is a suggestion that two sessions alone may be inadequate.[19] Supervision of some sessions appears to be vital.[20] The optimal length of an outpatient course is in the region of 6–8 weeks, allowing adequate time to achieve a physiological training effect where possible. There is some suggestion of a dose-response effect occurring before and extending beyond this period. A pragmatic approach would currently suggest a 6 week outpatient programme with two supervised sessions and additional instructions to train at home on a daily basis. Inpatient rehabilitation has similar benefits to the outpatient programmes but is more expensive, although improvements may occur over a shorter period of 2–3 weeks.[21]

The core content of a rehabilitation programme is discussed below but should include aerobic physical exercise training and information on disease education. Additional components could include limb strength and upper limb training, psychological intervention, smoking cessation, and nutritional intervention. There is now evidence that such a comprehensive individually tailored programme of rehabilitation will improve functional exercise capacity, reduce exertional dyspnoea, and improve health status (box 2).[1 2] Health economic benefits of rehabilitation are only just beginning to be explored, but reductions in hospital admission frequency, duration of stay, exacerbation rate, general practitioner home visits, and bronchodilator usage have all been reported.[22–25]

DOSE RESPONSE EFFECT AND MAINTENANCE

The improvements in health status measurement and exercise performance following pulmonary rehabilitation do not appear to be related to each other. Increases in exercise performance can occur quite quickly, but the changes in health status may lag behind as patients adjust to the lifestyle change. The optimum duration of physical training is unknown since direct comprehensive comparisons of the length of programmes have not yet been published. One recent comparison suggests that improvements in physical performance occur by 4 weeks, but the improvements in health status may take longer.[26] Outpatient programmes lasting 4–12 weeks have been shown to be effective, but programmes longer than this add little.[27] The improvements in exercise tolerance and health status achieved by rehabilitation have been shown to decline after 6–12 months.[22 28 29] The benefits of rehabilitation are still evident up to 1 year, irrespective of attendance at a follow up programme, and may persist for longer.[23 30 31] One third of patients may still retain significant improvements in health status after 2 years. There is no substantial evidence that prolonged maintenance treatment is beneficial or, if it is, what form it should take. If it does have a role, then comparisons have suggested that a monthly follow up programme results in greater improvements than weekly follow up, perhaps because of greater self-reliance.[32]

COST

Programme costs will depend upon the size and scope as well as transport and personnel costs. In the UK survey in 1998, annual costs of outpatient programmes ranged from less than £2000 to more than £20 000 per programme. The cost for each participant was about £400–700.[1]

SAFETY ISSUES

The prevalence of ischaemic heart disease in this population has not been well defined. The rate of critical incidents occurring during routine maximal exercise testing, even in patients with cardiac disease, is small.[33] Modest physical exercise does not appear to produce myocardial repolarisation abnormalities, even in the presence of hypoxaemia, in patients with COPD.[34] However, it is recommended that simple first aid medication (oxygen, nebulised bronchodilators, glyceryl trinitrin, etc) should be available on site. Staff supervising exercise programmes should be trained in resuscitation (e.g. to Advanced Life Support (ALS) standard). The backup of a hospital arrest team is probably unnecessary.

The components of rehabilitation

PHYSICAL TRAINING

Patients with COPD stop exercising because of shortness of breath or muscle fatigue. Thus, physical exercise training is a universal component of pulmonary rehabilitation programmes. As previously stated, physical training results in improved exercise tolerance, measurable changes in the physiological response to exercise, and improvements in health status. The optimal length, duration, frequency, and intensity of training sessions remain to be precisely determined.

ENDURANCE (AEROBIC) TRAINING

The most widely used modalities of exercise training are walking and cycling, singly or in combination, and should be considered in terms of frequency, duration, and intensity. To demonstrate a physiological training effect, outpatient courses should have[35]:

- a course duration of 4–12 weeks[36–39];
- supervised training sessions 2–5 times per week;
- a session duration of 20–30 minutes;
- a target exercise intensity corresponding to at least 60% of the maximum attained power output or $\dot{V}O_2$peak in a preliminary progressive maximal exercise test; Alternatively, 60% of the maximal walking speed achieved on the shuttle walk test could be used.

Two effective strategies for progressing the exercise prescription have also been described:
(1) Setting the duration of continuous exercise and then gradually increasing the work rate towards the target level.[31]
(2) Setting the intensity of exercise and then increasing the duration of the exercise period towards the target duration.[40 41] Supervision is needed to ensure progressive training. In those unable to sustain extended exercise bouts, an interval training technique may be used.[42]

The training intensity may be set using heart rate, treadmill speed, shuttle walking speed, or cycle ergometer load at the given percentage of peak work rate during the preliminary exercise test. Heart rate on exercise does not seem to be a strong predictor of work intensity in COPD.[43] However, dyspnoea ratings (e.g. the Borg scale) may be used in a similar way to set exercise intensity using a target level of dyspnoea.[44–46]

Training at a high percentage of peak work capacity can be achieved in COPD. True physiological training may only be achieved with these high relative training intensities, but useful benefits in functional performance may occur with lower levels of supervised activity. This is because enhanced exercise task capacity can also be achieved by improvements in confidence, ergonomics, or reduction in the affective component of dyspnoea.[47]

Patients with COPD often report difficulty with tasks involving the upper limbs. Upper extremity exercise by, for example, arm ergometer cranking or unsupported arm exercise using weights may therefore be a useful addition to the process.

STRENGTH TRAINING

Isolated muscle strength training by repetition with weights has been shown to produce improvements in walking endurance, muscle strength, and health status but not maximal capacity.[48] Low intensity peripheral muscle training has also been shown to be beneficial,[49] and training is achievable without injury.[50] Unloaded repetitions may allow severely disabled patients to begin training.[49] The addition of strength training to aerobic exercise improves muscle bulk and strength but does not improve whole body exercise performance or health status beyond that achieved by aerobic exercise alone.[51] Demonstrable skeletal muscle weakness is present even in mild COPD and can be improved by training.[52]

RESPIRATORY MUSCLE TRAINING

Inspiratory muscle strength may be reduced in some patients with COPD. Training the respiratory muscles can improve strength and endurance, but this appears to be task specific and the effects do not have an impact on overall disability or handicap.[53] It is possible that respiratory muscle training loads used to date have been inadequate or that combined training is necessary to produce a wider effect. For the present, respiratory muscle training is not an essential component in rehabilitation.

Respiratory muscle support by non-invasive ventilation may have a role in rehabilitation. There is some evidence that nocturnal domiciliary non-invasive ventilation (NIPPV) can augment the effects of a rehabilitation programme in patients with severe COPD.[54 55] It is also possible that NIPPV during exercise can enhance skeletal muscle training by overcoming a ventilatory limit to exercise where that exists. At present this technique is limited to the laboratory treadmill since current portable NIPPV devices do not offer any advantage in patient performance.[56]

USE OF OXYGEN DURING EXERCISE TRAINING

Patients with normal oxygen tension at rest can show frequent and sometimes severe desaturation during activities of daily living,[57] so the prescription of oxygen in rehabilitation is a difficult area. There is no consensus about identification of the need for supplemental oxygen or the optimal mode of delivery, but the routine use of supplemental oxygen in patients undergoing mild exercise induced desaturation does not enhance rehabilitation outcomes.[58 59] Most published studies do not report oxygen usage but, for the present, it would be reasonable to recommend that supplementary oxygen be provided during exercise when clinically important desaturation (Spo_2 <90%) has been found at the training load in the preliminary test. Clearly, once ambulatory oxygen is recommended for training, then it should be continued for similar activity at home, in line with the recent guidelines from the Royal College of Physicians.[60]

EDUCATION

Patient education is a central feature of pulmonary rehabilitation but is not effective alone in improving health status or physical performance without the other components.[61] However, it may improve medication habits.[25 62] Areas commonly covered by the education component are shown in box 3. The form of delivery of these talks should be determined by available local resources. Additional material in the form of leaflets and continuing education instructions may also be useful.

PSYCHOLOGY AND BEHAVIOURAL INTERVENTION

The role of psychological disturbance such as anxiety and depression in the development of disability in lung disease remains uncertain.[63] However, the coexistence of reduced self-efficacy and the affective component of dyspnoea is likely to have an effect on performance. Improvements in self-efficacy for walking and the emotional components of health status have been demonstrated after rehabilitation. Where anxiety and depression exist, they can be improved by rehabilitation.[64] Psychological and behavioural intervention is already embedded in the structure of rehabilitation programmes through the delivery of education, small group discussions, and relaxation therapy. Antidepressant or anxiolytic pharmacotherapy appears to have no additional general value. The role of specific, individual, or group psychotherapy is also unclear.

One area where psychological assessment may prove fruitful is in the assessment of motivation since identification of readiness to change may improve compliance with physical training.[65]

- Anatomy, physiology, pathology and pharmacology (including oxygen therapy)
- Dyspnoea/symptom management, chest clearance techniques
- Energy conservation/ pacing
- Nutritional advice
- Managing travel
- Benefits system
- Advance directives
- Making a change plan
- Anxiety management
- Goal setting and rewards
- Relaxation
- Identifying and changing beliefs about exercise and health related behaviours
- Loving relationships/sexuality
- Exacerbation management (including coping with setbacks and relapses)
- The benefits of physical exercise

Box 3 Suggested content of education sessions.

PHYSIOTHERAPY, RELAXATION EXERCISES, AND ENERGY CONSERVATION

Individual physiotherapy advice to patients with sputum production is an appropriate component of rehabilitation when this has not been addressed previously. The physiotherapist also has a role in providing advice about relaxation and breathing retraining techniques. The true value of these techniques has not yet been established, although they may be popular with patients. Clinical trials of diaphragmatic breathing retraining or pursed lip breathing have not been shown to be effective.[66] The benefits of energy conservation advice have also not been formally explored although they would seem to have some intrinsic merit. Occupational therapy may be particularly helpful in this area.

NUTRITION

Poor nutrition frequently accompanies advanced lung disease and is an independent predictor of worsening mortality and health status.[67–69] This is not always evident from simple weight or body mass index (BMI) estimates. Wherever possible a measure of fat free mass should be made to identify those affected. Other patients may be obese and dietary advice to both groups may be helpful. Nutritional supplements can increase fat free mass and muscle strength; the effect on efficiency of physical training is unknown but is currently being explored. Anabolic agents are also being examined and may increase muscle bulk but not exercise capacity.[70] A recent meta-analysis has concluded that nutritional support alone has no effect in improving anthropometric measures, lung function, or functional exercise capacity.[71] However, the number of adequate studies available for analysis was fairly small.

REHABILITATION AND LUNG VOLUME REDUCTION SURGERY

Lung volume reduction surgery (LVRS) offers hope of improvement for some selected patients with heterogeneous emphysema. Prior rehabilitation is an important prerequisite to ensure maximal preoperative fitness and to allow patients to make an informed decision. Surgery results in improvements in forced expiratory volume in one second (FEV_1), exercise performance, and health status beyond that obtained by rehabilitation alone.[27 72] Doubts remain regarding the long term cost effectiveness of surgery in comparison with rehabilitation, but these will be answered by current trials. Detailed comparisons between rehabilitation and LVRS are probably unhelpful since rehabilitation is applicable to almost every patient with chronic lung disease while surgery applies only to a select few.

Assessing the benefits: process and outcome

The individual assessment of patients and evaluation of programmes should be embedded in the process of rehabilitation. Outcomes can be informally categorised into the WHO categories of impairment, disability, and handicap.[5] This classification is now being revised so that social and environmental effects can be better incorporated.

Impairment of lung function does not reverse with rehabilitation, although its measurement may be important to describe the population. Skeletal muscle dysfunction and nutritional status are secondary measures of impairment and are capable of improvement. Peak oxygen uptake and dyspnoea during maximal exercise is also a measure of physiological impairment. The gold standard measure is a laboratory exercise test on either a treadmill or cycle ergometer. A symptom limited maximal test has been shown to be sensitive to change following rehabilitation where an increase in $\dot{V}O_2$peak of approximately 15% has been reported.[73]

In the setting of the rehabilitation programme, disability can be pragmatically assessed by testing functional capacity with a field based exercise test such as the timed 6 minute walk test (6MWT) or a shuttle walking test (SWT, incremental or endurance). One difficulty with the interpretation of studies that have used timed walking tests has been the lack of standardisation that may have led to factitious improvement.[74] A change of 54 m has been suggested to be the minimum needed for clinical significance in a properly conducted 6MWT.[75] A similar value for the incremental SWT has not yet been identified, although changes in the region of 30–55% have been reported following rehabilitation.[16 22 28] A test of endurance shuttle walking capacity is even more sensitive to change.[76] A measure of dyspnoea or fatigue (VAS or Borg) alongside exercise testing should be considered to increase the sensitivity of exercise measurements.

Handicap, or the social impact of disease, can be assessed using health status measures. General measures have been employed such as the Short Form-36 (SF-36) or Quality of Well Being Scale (QWB) which demonstrate less sensitivity than disease specific questionnaires but have value for cross disease comparisons and health economic analysis.[77–79] The Chronic Respiratory Questionnaire (CRQ) is consistently sensitive to change and clinically significant levels of change have been published.[75] A recent meta-analysis showed an improvement in the dyspnoea and fatigue components of the CRQ in 14 randomised controlled trials of rehabilitation.[73] There is, however, no universally applicable health status measure. The characteristics of the different questionnaires may make them specific to the context and purpose in which they are used.[80] The results may therefore vary slightly according to the character of the rehabilitation programme. It has also become clear that measures which appear to be less immediately sensitive, such as the St George's Respiratory Questionnaire (SGRQ), may in fact be more durable once clinically important change is achieved.[22] In the absence of maintenance rehabilitation therapy, this change may confirm a genuine change in lifestyle. Most health status measures encompass aspects of impairment, disability, and handicap. Only one questionnaire, the Psychosocial Adjustment to Illness Scale-Self Report (PAIS-SR) which measures handicap alone by examination of the pyschosocial adjustment to illness, has been applied in the context of pulmonary rehabilitation.[81] The choice of questionnaire as outcome measure may also be influenced by the ease of use. The CRQ is easy to score but currently may take 20 minutes to administer, while the SGRQ is nominally self-administered but has more complicated scoring.

The central aim of rehabilitation is to increase function, and there are an increasing number of questionnaires of functional status in this field—for example, the Pulmonary Functional Status Scale (PFSS) and Pulmonary Functional Status and Dyspnoea Questionnaire (PFSDQ)—but their sensitivity to change following rehabilitation has only undergone limited study.[82] Some argue that information on function is already included in some of the disease specific health status measures and additional questionnaires are unnecessary.

As domestic independence is an important goal of rehabilitation, this should be reflected by standardised activity of daily living (ADL) scales. People with chronic respiratory disease may, however, have different challenges to those with other disabilities so two disease specific ADL scales have recently been reported for use in chronic lung disease.[83 84] One further development has been the use of physical activity monitors to record general levels of domestic movement.[85 86]

PROCESS AUDIT

Audit of pulmonary rehabilitation provision should address fundamental recruitment and retention issues as well as the outcome measures identified above. Examples of process research include the compliance rate, adherence to exercise prescription, and patient satisfaction. Quality control of programmes across the UK has not yet been addressed. Minimum standards should be identified and development of a national database encouraged.

The health need and further development

The scientific exploration of pulmonary rehabilitation has only just begun, but research has already had an immediate impact on clinical practice. Many questions remain unanswered concerning the optimum format, conduct, and delivery of programmes. The complete impact of rehabilitation on the lives of patients and their relatives is largely unexplored and the health economic issues are currently being addressed. Understanding of the nature of disability in lung disease has improved by altering the focus away from the lung to the skeletal musculature with the promise that other methods of enhancing physical performance in addition to physical training may be effective.[87]

There are now strong arguments for the widespread development of pulmonary rehabilitation services. The prevalence of disability due to chronic respiratory disease is high. Pulmonary rehabilitation is a safe, effective, and inexpensive intervention which may reduce health service usage and is popular with patients and clinicians alike. The need for the service is evident, the demand for rehabilitation is substantial, while the capacity to supply rehabilitation services is poor. To improve the situation, action from consumers, health professionals, and even commissioners of health care will need to be stimulated, but the evidence already exists to justify immediate investment in pulmonary rehabilitation services for patients with chronic lung disease.

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